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Mr. Samuel J. Collins, Director  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738

Subject: Pre-Application Review of ACR-700

Dear Mr. Collins,

AECL Technologies Inc., the US subsidiary of Atomic Energy of Canada Limited ("AECL") hereby requests pre-application review of the AECL ACR-700 reactor design. The review would be performed pursuant to NUREG-1226, "Development and Utilization of the NRC Policy Statement on the Regulation of Advanced Nuclear Power Plants". The results of the review will provide guidance on the application for Design Certification of the ACR-700.

AECL is a North American company with business offices in Washington, DC and Mississauga, Ontario. It is responsible for the design of the CANDU<sup>®</sup> reactor series and for performing most of the fundamental research and development in support of the technical basis for the CANDU design. There are currently 31 CANDU reactors around the world, supported by local AECL offices. Since 1990, the company has initiated construction of seven CANDU 6 reactors worldwide, with four completed and three units currently under construction, all on time and on budget. AECL also operates a global reactor services business, supporting customers over the complete life-cycle of the reactor including commercially-funded research and development, design, construction, operation and management services, waste management and decommissioning.

AECL's ACR-700 design is a 700 MWe class light-water-cooled reactor that incorporates what we believe to be the best of both CANDU and light-water reactor technologies. It uses a conventional CANDU reactor cooling system, with two steam generators and four heat transport pumps. The design, which is the first in the CANDU series to have a negative void reactivity coefficient, uses slightly enriched uranium fuel, light water coolant, a separate heavy water moderator, computer-controlled operation, and on-power refuelling with the simple, robust CANDU fuel design. The reactor has horizontal pressure tubes supported in a tank filled with the low-pressure, low-temperature heavy water moderator. The tank also supports the reactivity regulating and safety devices, which are located within the low pressure moderator.

The ACR is an evolutionary development of existing CANDU reactors, which have operated safely and cost-effectively for many years in Canada and other countries. As such, the ACR incorporates the proven, Defence-in-Depth characteristics of CANDU technology, including a long prompt neutron lifetime, small reactivity holdup, a control system capable of terminating most accidents, two fast, totally independent, dedicated safety shutdown systems; an emergency core cooling system; a steel-reinforced concrete containment; and a heavy water moderator which provides an additional, passive, large heat sink that can further mitigate core heatup during potential severe accident scenarios. The ACR-700 design incorporates further enhancements, such as a highly stable core design, large operating margins, and long times available for operator action.

The ACR-700 preserves and enhances the CANDU features that make it resistant to terrorist attack and to sabotage. In addition to the high integrity containment, other ACR-700 Defence-in-Depth design features, such as redundancy and separation of systems and fail-safe safety system action, will help to safely mitigate the potential consequences of the actions of hostile intruders.

The ACR-700 is designed to be the lowest-cost of the new generation of reactor designs. Using advanced construction techniques from AECL's current 700 MWe class CANDU 6 design in China, AECL has been able to significantly reduce construction time and cost. The use of light water coolant and slightly enriched fuel also gives large reductions in capital cost, due to the greatly reduced heavy-water inventory and the reduction in reactor core size. All ACR-700 systems and components, including the fuel, can be fully manufactured in North America.

The NRC's "Statement of Policy for the Regulation of Advanced Nuclear Power Plants," dated July 8, 1986, encourages early discussions between the NRC and reactor designers as a mechanism for providing licensing guidance. NUREG-1226, issued in June 1988, provides guidance on the implementation of this policy and describes the NRC's approach in reviewing advanced reactor designs. The NRC conducts pre-application reviews of advanced reactor designs to identify: (1) major safety issues that could require Commission policy guidance to the staff; (2) major technical issues that the staff could resolve under existing regulations or NRC policy; and (3) the research needed to resolve identified issues. We believe that certification of the ACR-700 should not depend on a change in regulation, therefore, only items (2) and (3) would apply to a pre-application review of the ACR-700.

Regarding item (2), AECL Technologies Inc. believes that world experience with the CANDU design series coupled with certain factors associated with the ACR-700 design should enable ready resolution of technical issues by NRC staff. These factors include the successful licensing of CANDU technology in multiple jurisdictions around the world, a well-supported technical basis for the design, extensive operational experience with CANDU reactors, the evolutionary nature of the ACR-700 design relative to existing CANDU designs, numerous similarities between the ACR-700 and other light-water-cooled reactors, and experience with the preparation and submission of the application for Standard Design Certification of CANDU 3U. Although the latter project was terminated at AECL's request in 1995, due to the unfavourable near-term market at that time for new nuclear plants in the U.S.A., the experience gained in NRC reviews, and in meeting U.S. licensing requirements, will be useful in the ACR pre-application process.

Regarding item (3), AECL Technologies Inc. believes that the extensive research base already created through decades of analysis, development, qualification, testing, and operation of CANDU materials, components, fuel (including enriched fuel), systems, and reactors worldwide; together with additional ACR-specific testing being undertaken by AECL, should be sufficient to allow assessment of the adequacy of the ACR-700 design, with possibly some limited confirmatory R&D directed by the NRC.

AECL Technologies anticipates that the pre-application review would be conducted in two phases, as is the case with the AP1000 and the ESBWR. During Phase 1, the NRC would familiarize themselves with the ACR-700 design and the scope of the available and planned analysis, testing and operational experience in support of the design. In addition to identifying issues that may require further testing, the NRC would also determine and document their resource and schedule requirements for completion of Phase 2. AECL Technologies Inc. recognizes that it is very important, given the long lead times associated with testing, to identify with the NRC, as soon as possible, any technical issues that may require further testing. In Phase 2, the NRC would perform an assessment of the technology basis for the design, identify any technical issues and provide an estimate of the resources and schedule required for Design Certification. It is expected that both phases would be completed in about 18 months total, though a better estimate of the schedule will emerge from ongoing discussions with the NRC.

AECL Technologies Inc. also notes its awareness of ongoing cooperation between the NRC and the Canadian Nuclear Safety Commission (CNSC). AECL Technologies Inc. would like to propose to both regulatory agencies the possibility of having regulatory staff exchange as a means to help ensure close liaison and timely resolution of technical issues associated with the pre-application review of the ACR-700.

AECL Technologies Inc. understands that the scope of a pre-application review is strongly influenced by the vendor. However, for the review to successfully identify, and provide resolution pathways, for all of the salient issues associated with an eventual design certification of the ACR-700, we also recognize that we must interface well with the NRC staff to ensure that complete information of interest is supplied to them in a timely and pre-scheduled manner. Mr. Vince Langman is the US Licensing Manager for the ACR-700 and will be the point of contact with the USNRC. He can be reached in the United States by telephone at (202) 354-3863 and by e-mail at [langmanv@aecltechnologies.com](mailto:langmanv@aecltechnologies.com); or in Canada by telephone at (905) 823-9060, extension 6543 and by e-mail at [langmanv@aecl.ca](mailto:langmanv@aecl.ca). Please let me know who the NRC point of contact will be for the pre-application review.

Sincerely,



Robert Van Adel  
President and Chief Executive Officer  
Atomic Energy of Canada Limited

Copy to: J.E. Lyons (USNRC)  
Dr. D.F. Torgerson (AECL)  
A.A. Hawryluk (AECL)